Preliminary comparison between ASO and TLS lidar data from NASA SnowEx data

Photo: Chris Hiemstra
TLS Site A

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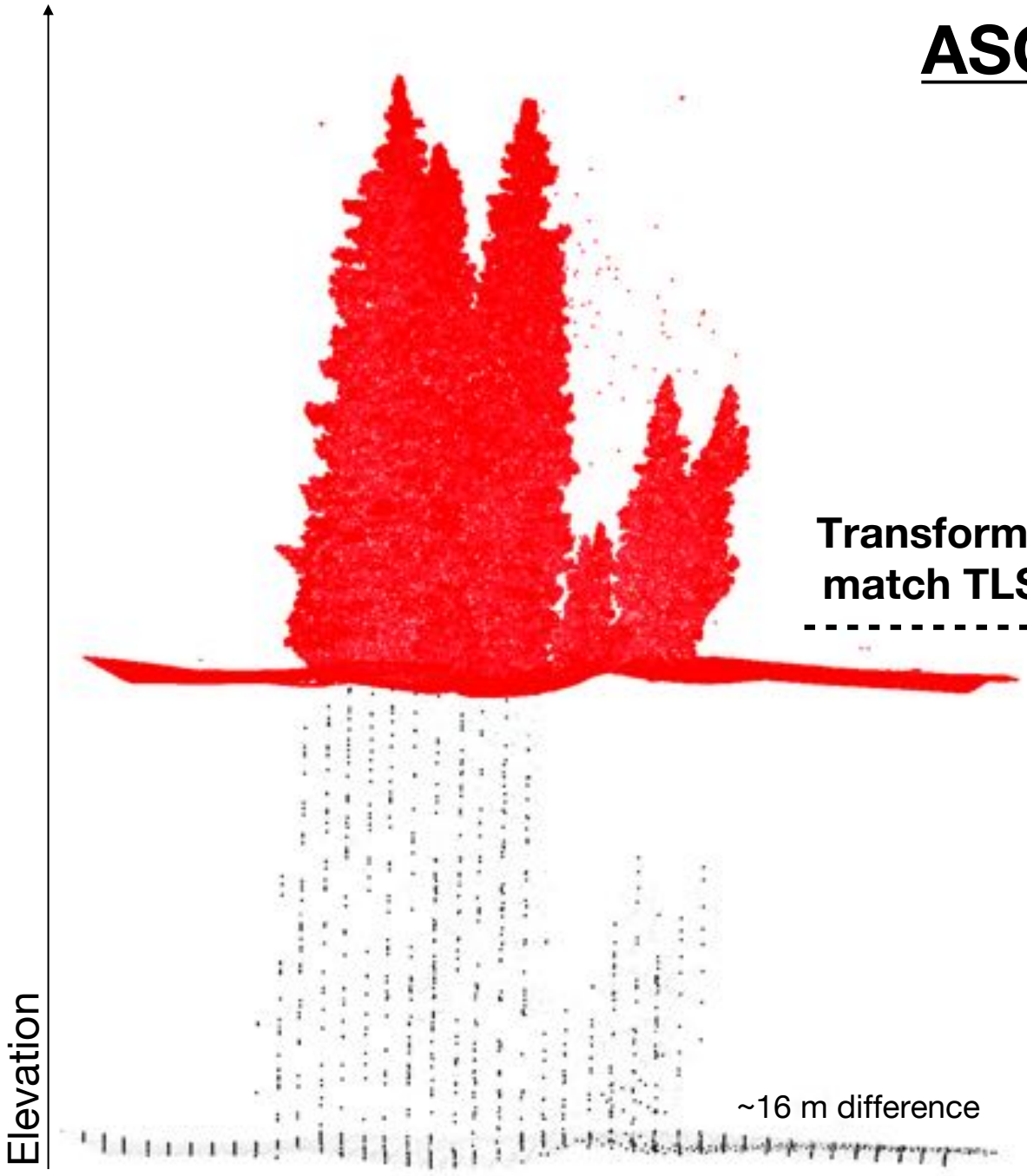
Also thanks to: Kat Bormann, Jeff Deems, Tom Painter, Lucas Spaete, Zach Uhlmann, Nancy Glenn, Christopher Hiemstra, and Arthur Gelvin

TLS Site K

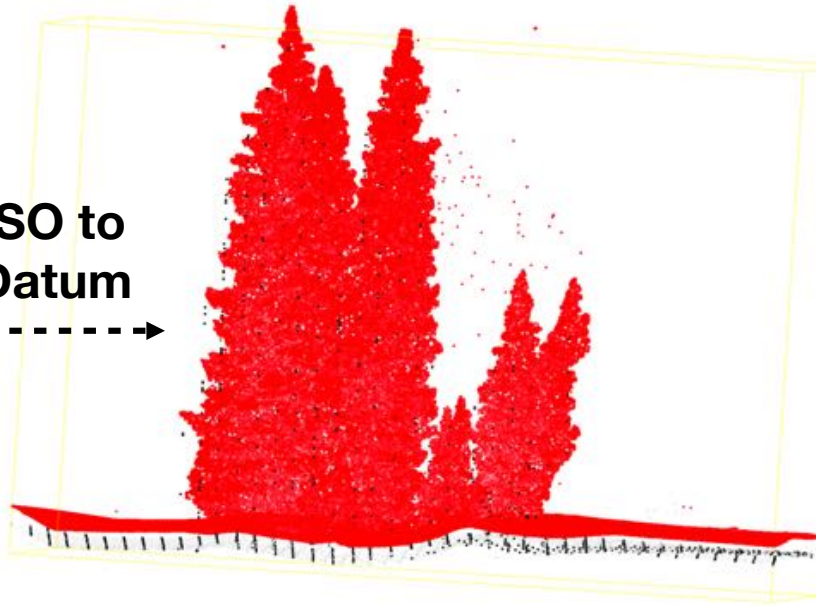

Mesa Lakes
Lodge
Grand Mesa Lodge
"Snow Mobiles"
SiteK
Site A
SiteN
Google Earth

ASO vs. TLS Point Clouds

TLS: NAVD88 vertical datum (geoid)
ASO: Height above WGS84 ellipsoid



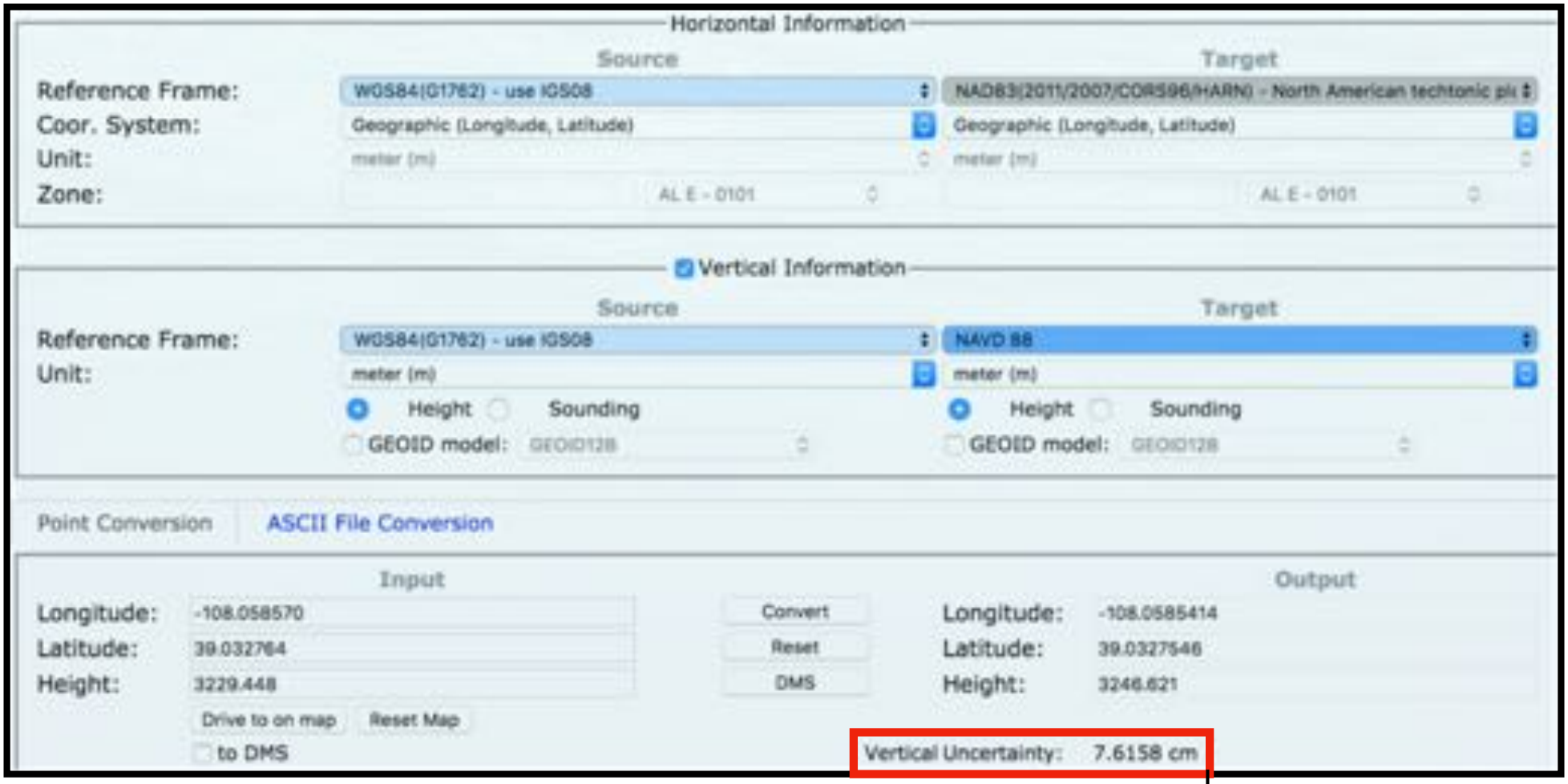
Transform ASO to match TLS Datum



NOAA NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
UNITED STATES DEPARTMENT OF COMMERCE

VERTICAL DATUM TRANSFORMATION

INTEGRATING AMERICA'S ELEVATION DATA

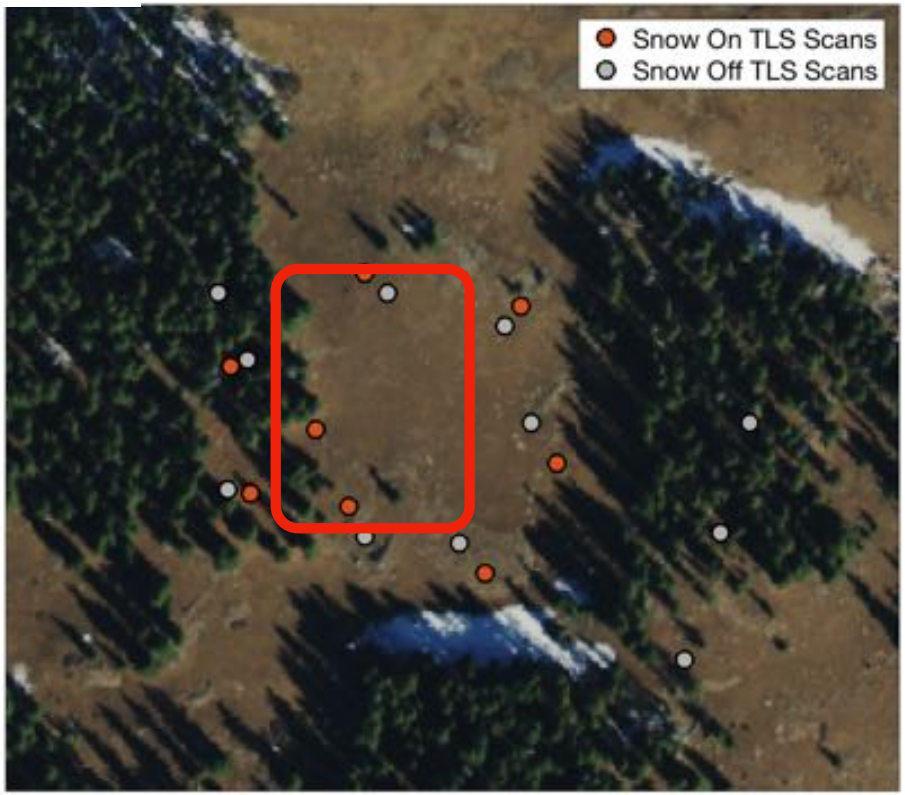


Vertical Uncertainty Due to Transformation: 7.62 cm

Point Cloud to Raster

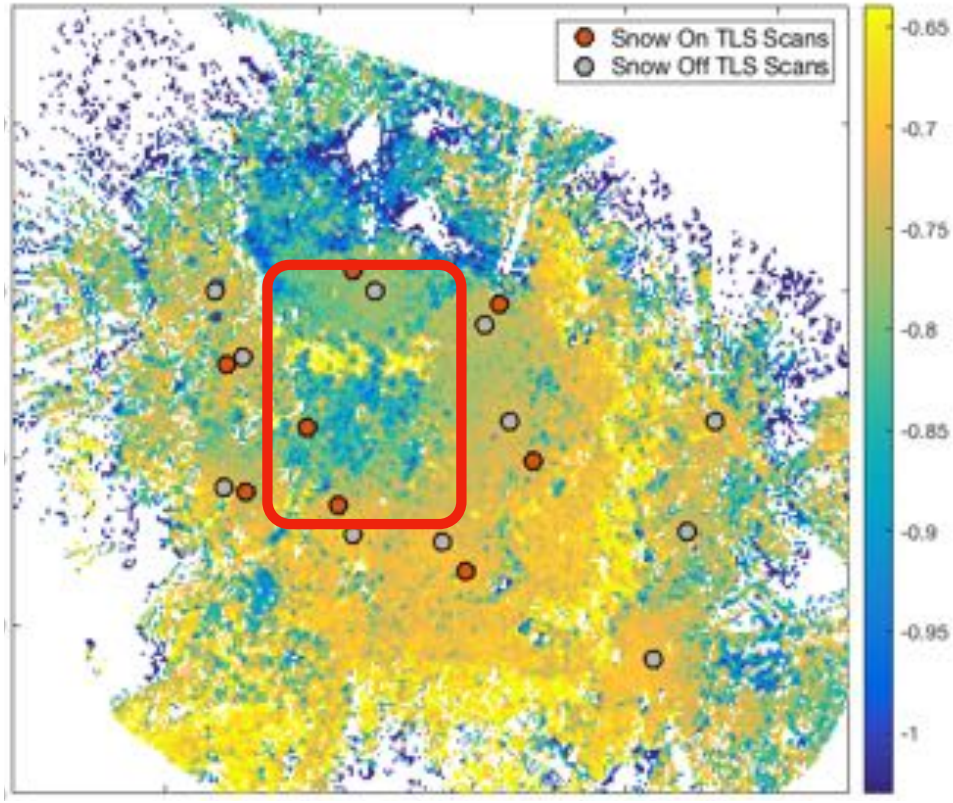
1. Used licensed version of lasground (lasTools) to **classify** the point cloud data
   - Parameters: step size of 2 - no offset - no thinning
   - Evaluated the sensitivity of these parameters using snow-off photos
2. **Gridded** the ground points using lasGrid (lasTools)
   - Took the average ground points within a 1-m grid

True Color Image



250 m

ASO-TLS Snow-Off Surfaces [m]



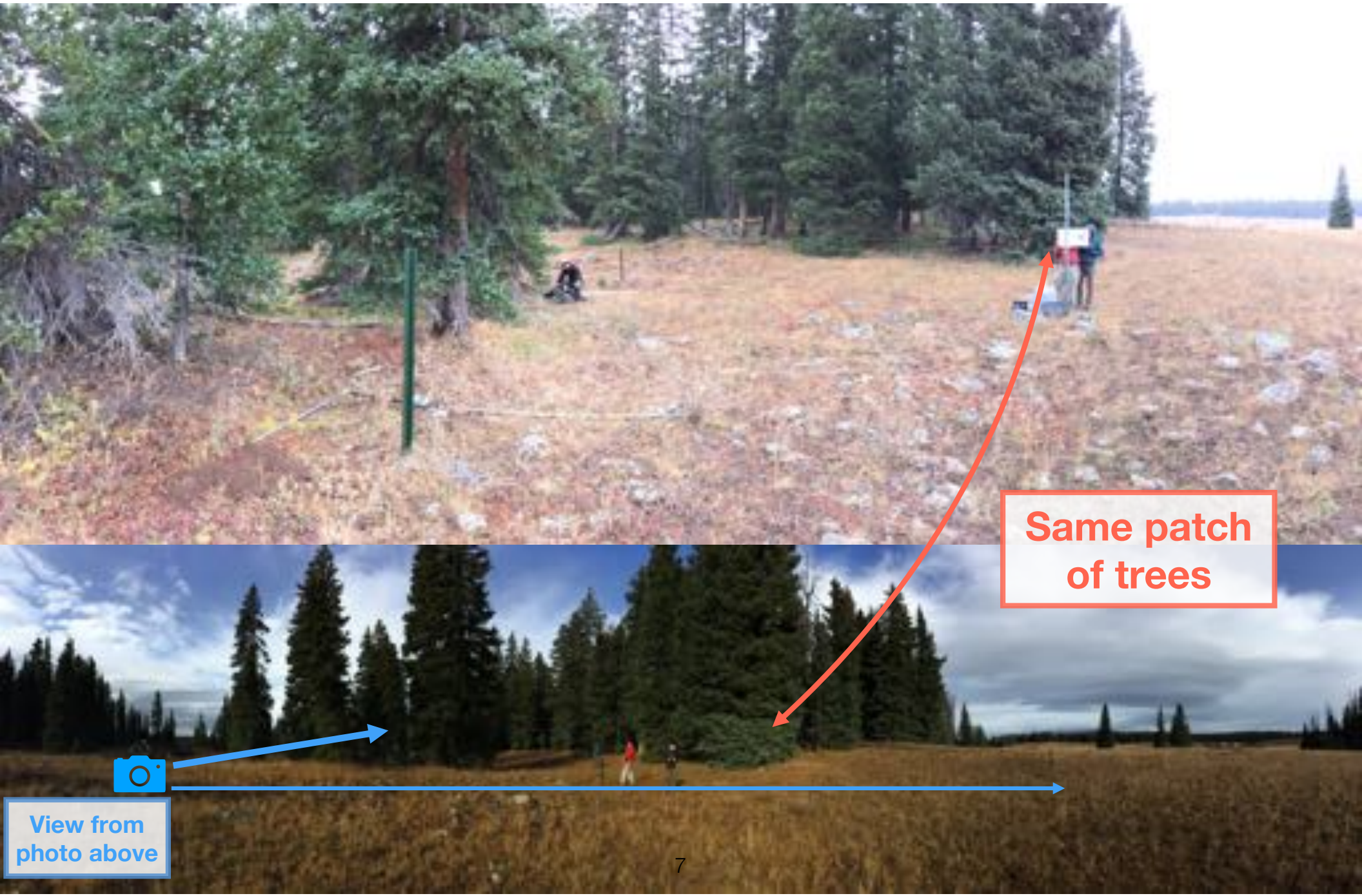
250 m

*Gridded to 1-m resolution

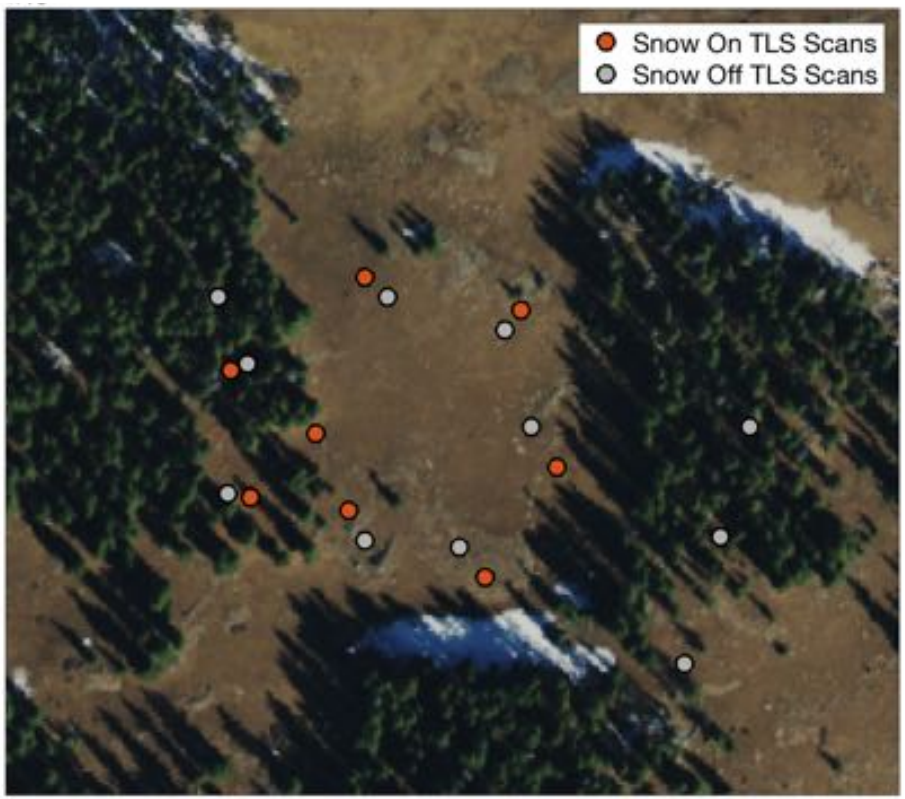
Key Points:

1. TLS was consistently higher in elevation than ASO despite same vertical datum (NAVD88)
   - Mean Difference: 81 cm, Median Difference: 76 cm
2. ASO - TLS "Snow-Off Differences" are very heterogenous (~30 cm differences)
3. Areas between snow-off TLS Scans (red box) had elevation differences that flipped with respect to the median value

Snow-Off Surface at Site K

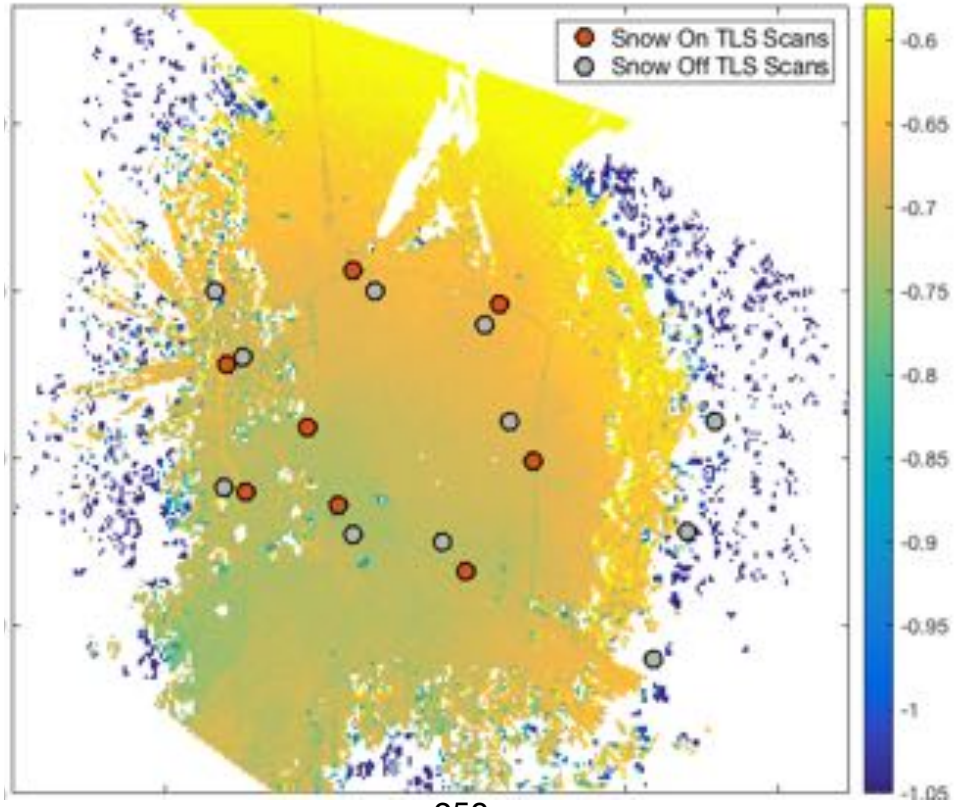


True Color Image



250 m

ASO-TLS Snow-On Surfaces [m]



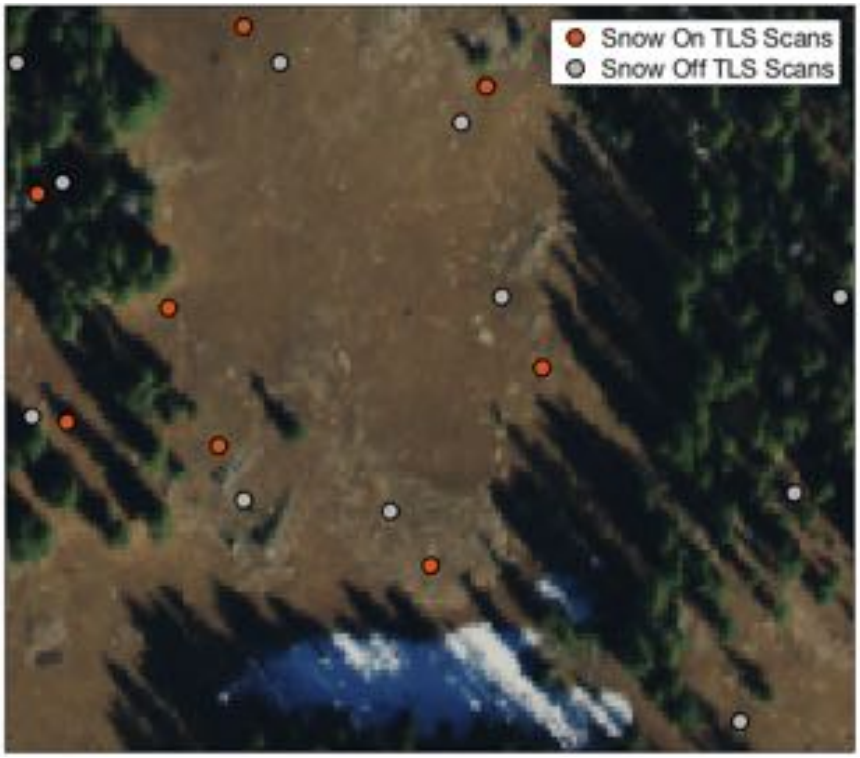
250 m

*Gridded to 1-m resolution

Key Points:

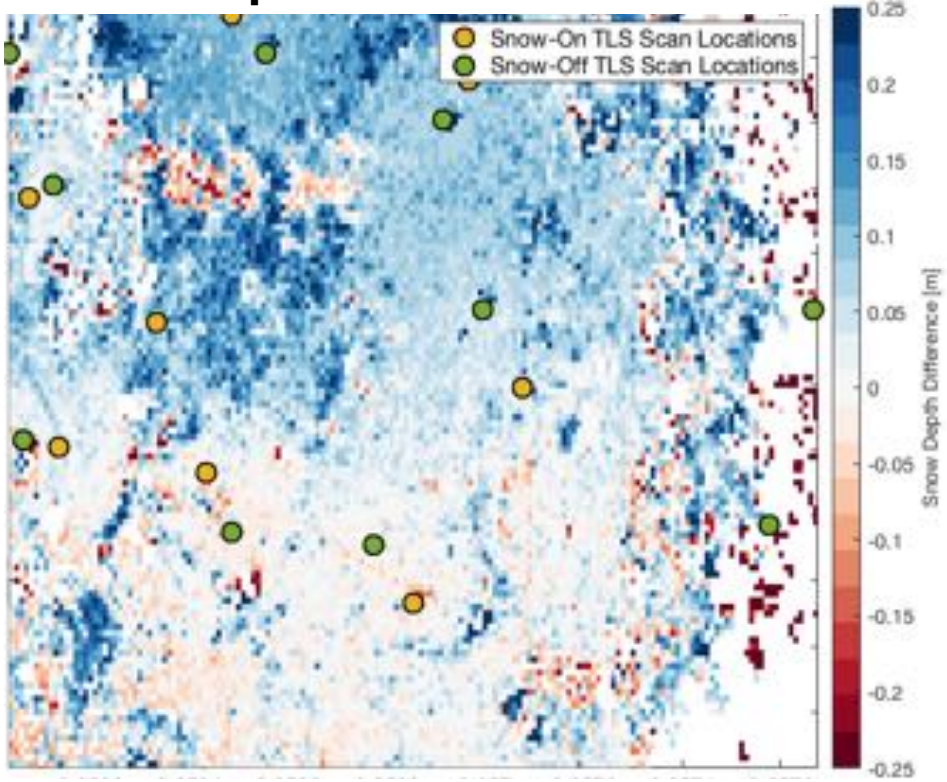
1. Again, TLS was consistently higher in elevation than ASO despite same vertical datum
   - Mean Difference: 74 cm, Median Difference: 69 cm
2. ASO - TLS "Snow-On Differences" are much smoother than "Snow-Off Differences"

True Color Image



250 m

Snow Depth Difference ASO-TLS



250 m

*Gridded to 1-m resolution

Key Points:

1. Snow depth differences within this domain were around 4.8 cm (mean) or 5 cm (median)
2. ASO snow depth higher in some areas (blue) while TLS higher in others (red)
3. Difficult to determine the source of these differences but the heterogeneity is likely from difficulty with obtaining the true snow-off surface.